

Hantavirus

(Also known as Hantavirus Pulmonary Syndrome [HPS] and Hantavirus Disease)



Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

Hantaviruses are single-stranded RNA viruses belonging to the bunyavirus family. Numerous hantavirus species exist. They are responsible for two primary syndromes: hantavirus pulmonary syndrome (HPS) and hemorrhagic fever with renal syndrome (HFRS).

B. Clinical Description

HPS is an acute febrile illness that progresses rapidly to severe respiratory failure (adult respiratory distress syndrome [ARDS]) and shock. Clinical findings during the 3–5 day prodrome are nonspecific, flu-like symptoms, including fever, fatigue, and muscle aches—especially in the large muscle groups. Gastrointestinal manifestations and dizziness may accompany these symptoms. As the disease progresses, symptoms can include cough and shortness of breath as the lungs fill with fluid. Once the cardiopulmonary phase begins, the disease progresses rapidly, necessitating hospitalization, and often, assisted ventilation within 24 hours. Renal failure and hemorrhagic manifestations, while common in HFRS, have been mild or absent in most recognized cases of HPS. The mortality rate is still not well-defined, but it appears to be approximately 40–50%. In survivors, recovery from the acute illness is rapid, with apparent restoration of normal lung function.

Classical hantaviral disease in humans in Asia and Europe targets the kidneys. HFRS includes hypotension, kidney failure, and bleeding. Mortality rates for HFRS range from 5–15%.

C. Vectors and Reservoirs

There are multiple hantaviruses that cause HPS, and they are each associated primarily with a single rodent species. The main reservoir for Sin Nombre virus (SNV) is the deer mouse, *Peromyscus maniculatus*, native to most of the U.S. Black Creek Canal virus is associated with the cotton rat, *Sigmodon hispidus*, found in the Southeast. The rice rat, *Oryzomys palustris*, found in the southern states of the U.S., acts as a reservoir for Bayou virus. In the northeastern states, the white-footed deer mouse, *Peromyscus leucopus*, has been associated with the New York-1 strain of hantavirus. The prevalence of infection in rodents varies greatly. Infected rodents generally develop a chronic, asymptomatic infection and can shed live virus in their saliva, feces, and urine throughout their lives. The duration of viremia and the persistence of virus in tissues indicate that rodents can contaminate the environment through their excretions and secretions for long periods.

D. Modes of Transmission

Humans are infected when they inhale dust that contains dried contaminated rodent urine or feces. Transmission may also occur when dried materials contaminated by rodent feces or urine are disturbed and are directly introduced into broken skin or into the eyes, nose, or mouth. There is no evidence of person-to-person transmission of HPS in the U.S.

E. Incubation Period

Since HPS is relatively uncommon, the incubation period has not yet been well-defined; it is believed to range from about 1–6 weeks, with an average of about 2 weeks.

F. Period of Communicability or Infectious Period

There has been no evidence of person-to-person spread of hantavirus in the U.S. Rodents can develop a chronic, asymptomatic infection with hantavirus and can remain infectious throughout their lives.

G. Epidemiology

HPS was first recognized in 1993; as of January 5, 2005, 384 cases have been confirmed in the U.S. Most cases are from the western half of the country. However, cases have been reported in 30 states, including one in a Massachusetts resident who acquired HPS in New York. About 75% of patients with HPS have been residents of rural areas. The distribution of identified cases reflects a seasonal trend, with peaks during the spring and the summer, although cases have occurred throughout the year. Any person whose occupation (e.g., biologist, pest-control worker) or recreational activities (e.g., hiking, camping) put him/her in frequent contact with rodents or their droppings is potentially at risk of getting the disease. Disturbing or inhabiting closed, actively rodent-infested structures is an important risk factor for contracting HPS.

HPS occurs in North and South America. There are several hantaviruses associated with HPS in the U.S. SNV is the agent responsible for the 1993 HPS epidemic, which occurred in the southwestern U.S. Black Creek Canal virus was implicated in a single HPS case in Florida. Bayou virus was discovered in cases in Louisiana and Texas. New York-1 virus is similar to SNV, but it is distinct enough to suggest that it is a variant found in the eastern third of the U.S. Most cases of HPS have been associated with SNV. HFRS caused by Hantaan virus or by Dobrava-Belgrade virus occurs mainly in rural areas of Asia and the Balkans. Seoul virus, which has a worldwide distribution, causes HFRS of variable severity. The Puumala virus causes milder HFRS in Europe.

H. Bioterrorist Potential

While this pathogen is not considered to be of risk for use in bioterrorism, the Centers for Disease Control and Prevention (CDC) lists hantavirus as a Category C bioterrorist agent.



Section 2:

REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report any suspect case of hantavirus infection based on a health care provider's medical diagnosis.

Note: See Section 3C for information on how to report a case.

B. Laboratory Testing Services Available

The MDPH State Laboratory Institute (SLI) does not provide diagnostic testing for hantavirus. However, the SLI Virus Serology Laboratory can arrange for serum samples to be forwarded to the CDC for testing. Specimens should be submitted with a complete case history.

For additional information on testing or on specimen submission, contact the SLI Virus Serology Laboratory at (617) 983-6396. Please call the laboratory prior to specimen submission.



Section 3:

REPORTING RESPONSIBILITIES AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- ◆ To assess the magnitude of the disease in different areas and among different risk groups.
- ◆ To identify outbreaks as soon as possible.
- ◆ To identify rodent sources of infection.
- ◆ To identify new hantavirus strains.
- ◆ To monitor the emergence of HPS in new areas and in new risk groups.
- ◆ To design more effective control or prevention methods.

B. Laboratory and Health Care Provider Reporting Requirements

Hantavirus infection is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of hantavirus infection, as defined by the reporting criteria in Section 2A.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of hantavirus infection shall report such evidence of infection directly to the MDPH within 24 hours.

C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities

Reporting Requirements

MDPH regulations (*105 CMR 300.000*) stipulate that hantavirus infection is reportable to the LBOH and that each LBOH must report any confirmed case of hantavirus infection or suspect case of hantavirus infection, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS) using a MDPH *Hantavirus Case Report Form* (found at the end of this chapter). Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

Case Investigation

The MDPH Division of Epidemiology and Immunization will direct case investigation of hantavirus disease in Massachusetts residents.

1. Following notification of the MDPH, the LBOH may be asked to assist in completing an official MDPH *Hantavirus Case Report Form* (found at the end of this chapter) by interviewing the case and others who may be able to

provide pertinent information. Most of the information required on the form can be obtained from the health care provider or from the medical record. Use the following guidelines to assist in completing the form:

- a. Record the case's demographic information.
 - b. Record the date of symptom onset, hospitalization information (if applicable), clinical information, and outcome of disease (e.g., recovered, died).
 - c. Exposure history: Use the approximate incubation period range for hantavirus (1–6 weeks). Specifically, focus on the period beginning about one week prior to the case's onset date back to approximately six weeks before onset for exposure to rodents. Record when, where, and what type of rodent. Record information on any travel.
 - d. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason(s) why it could not be filled out completely.
2. After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked "Confidential") to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)
305 South Street, 5th Floor
Jamaica Plain, MA 02130
Fax: (617) 983-6813

3. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Section 4.



Section 4:

CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (*150 CMR 300.200*)

None.

B. Protection of Contacts of a Case

None.

C. Managing Special Situations

Reported Incidence Is Higher Than Usual/Outbreak Suspected

If any cases of hantavirus infection are reported in your city/town or if you suspect an outbreak, investigate to determine the source of infection and the mode of transmission. Consult with the epidemiologist on-call at the MDPH

Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases across several town lines, which would otherwise be difficult to identify at the local level.

D. Preventive Measures

Environmental Measures

The best way to prevent hantavirus infection is to eliminate or minimize human contact with rodents or their excrement. Persons should:

- ◆ Clear brush, grass, and garbage from around building foundations to eliminate a source of nesting materials. Keep tight-fitting lids on all garbage cans.
- ◆ Use metal flashing around the base of wooden, earthen, or adobe dwellings to provide a strong metal barrier.
- ◆ Seal all entry holes ¼ inch wide or wider with lath screen or lath metal, cement, wire screening, or other patching materials, inside and out.
- ◆ Elevate hay, woodpiles, and garbage cans to eliminate possible nesting sites.
- ◆ Use an EPA-approved rodenticide with bait under plywood or plastic shelter along baseboards, or use trap, and properly dispose of rodents. Live trapping of rodents is not recommended.
- ◆ Clean all food preparation areas. Store all food (both human and pet) in rodent-proof containers.
- ◆ Do not leave open bowls of pet food outside. Discard any uneaten pet food properly at the end of the day.

Personal Preventive Measures/Education

People involved in cleaning rodent-contaminated areas should keep the following recommendations in mind:

- ◆ Clean droppings using a wet method, rather than a dry method such as sweeping or vacuuming. Spray disinfectant, such as dilute bleach, prior to cleaning, and use a wet mop or towels moistened with disinfectant to clean.
- ◆ Work in well-ventilated areas.
- ◆ Gloves, dust/mist masks, long-sleeved clothing, and protective eyewear may help prevent exposure.

A Hantavirus Public Health Fact Sheet is available at the MDPH Division of Epidemiology and Immunization or through the MDPH website at www.mass.gov/dph. Click on the “Publications and Statistics” link and select the “Public Health Fact Sheets” section under “Communicable Disease Control.”



ADDITIONAL INFORMATION

The following is the formal CDC surveillance case definition for hantavirus. It is provided for your information only and should not affect the investigation or reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting a case to the MDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at www.cdc.gov/epo/dphsi/casedef/case_definitions.htm.

Case Definition

An illness characterized by one or more of the following clinical features:

- ◆ A febrile illness (i.e., temperature $>101.0^{\circ}\text{F}$ [$>38.3^{\circ}\text{C}$]) characterized by bilateral diffuse interstitial edema that may radiographically resemble ARDS, with respiratory compromise requiring supplemental oxygen developing within 72 hours of hospitalization and occurring in a previously healthy person.
- ◆ An unexplained respiratory illness resulting in death, with an autopsy examination demonstrating noncardiogenic pulmonary edema without an identifiable cause.

Laboratory Criteria for Diagnosis

- ◆ Detection of hantavirus-specific immunoglobulin M (IgM) or rising titers of hantavirus-specific immunoglobulin G (IgG);
- ◆ Detection of hantavirus-specific ribonucleic acid sequence by polymerase chain reaction in clinical specimens; or
- ◆ Detection of hantavirus antigen by immunohistochemistry.

Case Classification

Confirmed

A clinically-compatible case that is laboratory-confirmed.

Comment

Laboratory testing should be performed or confirmed at a reference laboratory. Because the clinical illness is nonspecific and ARDS is common, a screening case definition can be used to determine which patients should be tested. In general, a predisposing medical condition (e.g., chronic pulmonary disease, malignancy, trauma, burn, and surgery) is a more likely cause of ARDS than HPS, and patients who have these underlying conditions and ARDS need not be tested.



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FORMS & WORKSHEETS

Hantavirus

Hantavirus



LBOH Action Steps

This form does not need to be submitted to the MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to hantavirus case investigation activities.

LBOH staff should follow these steps when hantavirus is suspected or confirmed in the community. For more detailed information, including disease epidemiology, reporting, case investigation, and follow-up, refer to the preceding chapter.

- ☐ Notify the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850 to report any suspect case(s) of hantavirus.
- ☐ Assist MDPH with obtaining clinical specimens needed for laboratory confirmation, if necessary.
- ☐ Assist MDPH with obtaining information needed to complete a MDPH *Hantavirus Case Report Form*.
- ☐ Send the completed case report form (with laboratory results) to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS).